

Asking Sensitive Questions: Testing A New Alternative to the Randomized Response Technique

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Sensitive Questions and Truthful Answers

- Challenge in survey research on sensitive topics: Getting a truthful answer to questions that have a clear socially desirable answer (e.g. 'No')
- For example, whether respondents...
 - ...have evaded tax payments.
 - ...have committed an act of violence.
 - ...have cheated in exams.
 - ...have plagiarized a research paper.
- Some respondents give no truthful ('Yes'-)answer because they fear consequences, deem it a too intrusive question or just feel uncomfortable answering truthfully (Tourangeau & Yan 2007).
- This leads to underestimation of the surveyed behavior (social desirability bias).

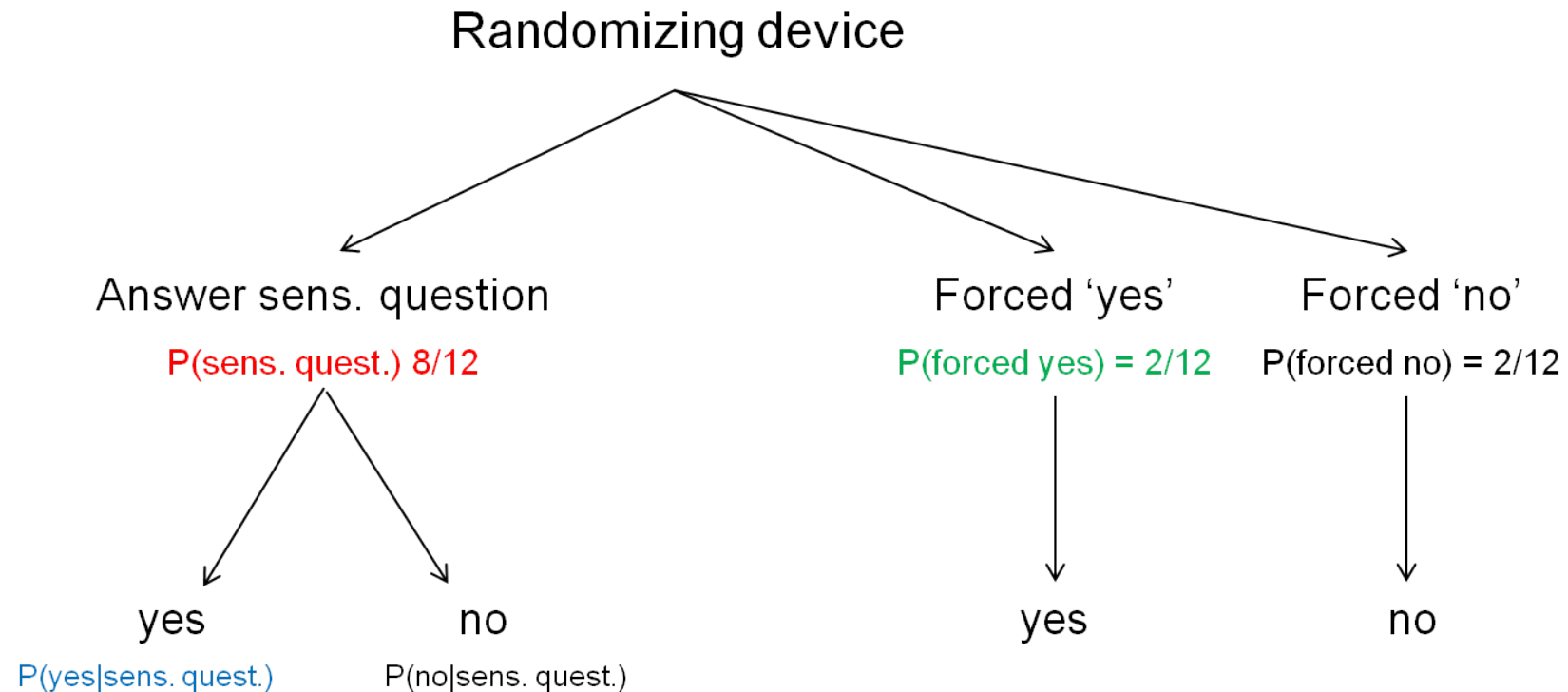
Eliciting Truthful Answers to Sensitive Questions – No Easy Task with Direct Questioning (DQ)

Share of respondents with false negative response (“liars”) from validation studies:

- Penal conviction: 42.5% (F2F, Wolter 2010)
- Welfare and unemployment benefit fraud: 75% (F2F, van der Heijden et al. 2000)
- Driving under influence: 54% (P&P, Locander et al. 1976)
- Bankruptcy: 32% (Ibid.)

An Indirect Approach: The Randomized Response Technique (RRT, forced response variant)

- Main principle: 100% privacy protection through randomization ('random noise in the answering process')
- A randomizing device, the outcome of which is only known to the respondent, decides whether...
 1. the sensitive question has to be answered truthfully
 2. a forced 'yes' has to be given
 3. a forced 'no' has to be given.
- An example: ≥



- Respondents give the true answer only with probability $P_{\text{sens. quest.}} < 1$ (and a forced yes/no with $P_{\text{forced yes/no}}$).
- Therefore, a 'yes' could be the true answer to the sensitive Question ($P_{\text{yes|sens. quest.}}$) but it could also just be a forced 'yes' ($P_{\text{forced yes}}$).

Critical Issues with RRT (forced response)

- Complicated procedure, low respondents' understanding of RRT's principle 'protection through randomization'.
- Reluctance of respondents to give a forced-yes (or a 'false' answer in general) (Edgell et al. 1982, Lensvelt-Mulders & Boeije 2007)
- Self-protective 'no'-bias (Jann, Jerke, Krumpal fc.)
- Seemingly bad performance in self-administered online-mode:
 - Lower prevalence estimates than DQ, even negative estimates (Böcherer et al. 2005, Holbrook & Krosnick 2010, Coutts & Jann 2011)
 - Not superior to DQ (but at least not worse...) (Coutts & Jann 2011, Peeters 2006, Snijders & Weesie 2008)

A New Alternative: The Crosswise Model (Yu et al. 2008)

- Simple idea: Ask a sensitive question and a non-sensitive question and let the respondent indicate whether...
 - A: the answer is 'yes' to both questions or 'no' to both questions
 - B: the answer is 'yes' to one question and 'no' to the other question

| | | <i>non-sens. question</i> | |
|-----------------------|-----|---------------------------|----------|
| | | no | yes |
| <i>sens. question</i> | no | A | B |
| | yes | B | A |

- In either case (A,B) the researcher does not know whether a particular respondent's answer to the sens. question is 'yes' or 'no'.
- The prevalence of the non-sens. question must be unequal to 0.5 and known (furthermore, it must be independent of the sensitive question)
- Examples: \geq \geq

Prevalence Estimation for the Crosswise Model

- Let...
 - X be the sensitive question with $\pi = \Pr(X = \text{yes})$
 - Y be the non-sensitive question with $p = \Pr(Y = \text{yes})$
 - X and Y are independent: $\text{Cov}(X, Y) = 0$
- Prevalence for observed answer option A (‘same answers’):

$$\phi = p\pi + (1 - p)(1 - \pi)$$

- Prevalence estimate for yes to sensitive question:

$$\hat{\pi}_{\text{CM}} = \frac{\hat{\phi} + p - 1}{2p - 1}$$

- Variance for prevalence estimate:

$$\widehat{\text{Var}}(\hat{\pi}_{\text{CM}}) = \frac{\hat{\phi}(1 - \hat{\phi})}{n(2p - 1)^2}$$

➔ Note that, formally, the crosswise model is identical to Warner’s RRT.

Study A: Experimental Comparison of Crosswise vs. Direct Questioning (Jann, Jerke & Krumpal fc.)

- Paper & pencil classroom survey on plagiarism at different Universities:
 - ETH Zurich, University of Leipzig, LMU Munich, Spring/Summer 2009
 - Total sample size approx. 500 students
 - Experimental conditions:
 - $\frac{1}{4}$ direct questioning
 - $\frac{3}{4}$ crosswise model
 - Thanks to Norman Braun and Jochen Gross for supporting the data collection at LMU Munich

Crosswise Item Study A

Block 1

1. Question: *Is your mother's birthday in January, February or March?*
2. Question: *When writing an assignment (e.g. seminar paper, term paper, thesis), have you ever intentionally adopted a passage from someone else's work without citing the original?*

How are your answers to the two questions?

- ☐ (A) **No to both questions or Yes to both questions**
- ☐ (B) **Yes to one of the two questions and No to the other one**

Results Study A: Prevalence Estimates by Experimental Condition (in %)

| Exp. Condition | | Partial plagiarism | Severe plagiarism |
|----------------------|-----------|-----------------------|----------------------|
| 1 Direct questioning | | 7.3 | 1.0 |
| | <i>se</i> | 2.7 | 1.0 |
| | N | 96 | 96 |
| 2 Crosswise | | 22.3 | 1.6 |
| | <i>se</i> | 5.5 | 5.0 |
| | N | 310 | 310 |
| Difference | | 15.0 | .6 |
| | <i>se</i> | 6.1 | 5.1 |
| | N | 406 | 406 |

Study B: Experimental Comparison of Crosswise vs. DQ vs. RRT

- Online survey on student cheating and plagiarism:
 - University of Bern, Switzerland, March/April 2011
 - Mailing to all 8'610 students
 - 2379 completed questionnaires → response rate of 27.6%
 - Random, balanced assignment of respondents to different experimental conditions:
 1. Direct questioning
 2. RRT forced resp. "Number picking"
 3. RRT forced resp. "Virtual random wheel"
 4. RRT forced resp. innoc. question "Benford"
 5. Crosswise "Number picking"
 6. Crosswise "Innocuous question"

Crosswise Item Study B

Question Pair 1

Question A: Is your mother's birthday in January or February?

(If you don't know, please take the birthday of another person you personally know.)

Question B: Have you ever copied from a fellow student during an exam?

Compare your answers to the two questions: Are the answers the same or different?

- ☐ same *(both Yes or both No)*
- ☐ different *(one Yes, and the other No)*

Results Study B: Prevalence Estimates by Experimental Condition (in %)

| Exp. condition | Copying in exam | Cheat sheet in exam | Perf. enhancing drugs for exam | Partial plagiarism | Severe plagiarism |
|---------------------|-----------------|---------------------|--------------------------------|--------------------|-------------------|
| Direct Quest. | 0.20 | 0.08 | 0.05 | 0.02 | 0.01 |
| SE | 0.02 | 0.01 | 0.01 | 0.01 | 0 |
| N | 393 | 393 | 392 | 288 | 289 |
| RRT forced resp. | 0.21 | 0.10 | 0.00 | 0.03 | -0.01 |
| SE | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| N | 1139 | 1140 | 1137 | 836 | 835 |
| Crosswise | 0.29 | 0.14 | 0.12 | 0.07 | 0.02 |
| SE | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| N | 765 | 767 | 760 | 564 | 562 |
| Difference CW - DQ | 0.10 | 0.06 | 0.08 | 0.04 | 0.01 |
| SE | 0.04 | 0.03 | 0.03 | 0.03 | 0.03 |
| N | 1158 | 1160 | 1152 | 852 | 851 |
| Difference CW - RRT | 0.08 | 0.04 | 0.12 | 0.04 | 0.03 |
| SE | 0.04 | 0.03 | 0.03 | 0.04 | 0.04 |
| N | 1904 | 1907 | 1897 | 1400 | 1397 |

Results Study B: Prevalence Estimates for 2 Different Crosswise-Versions – NSQ & RD (in %)

| Exp. condition | | Copying in exam | Cheat sheet in exam | Perf. enhancing drugs for exam | Partial plagiarism | Severe plagiarism |
|---|-------|--------------------|------------------------|--------------------------------------|-----------------------|----------------------|
| Direct Quest. | prev. | 0.20 | 0.08 | 0.05 | 0.02 | 0.01 |
| | SE | 0.02 | 0.01 | 0.01 | 0.01 | 0 |
| | N | 393 | 393 | 392 | 288 | 289 |
| Crosswise_NSQ (non-sensitive question version of Crosswise) | prev. | 0.32 | 0.19 | 0.15 | 0.06 | 0.06 |
| | SE | 0.05 | 0.04 | 0.04 | 0.05 | 0.05 |
| | N | 384 | 384 | 378 | 281 | 280 |
| Crosswise_RD (random-device version of Crosswise) | prev. | 0.26 | 0.09 | 0.10 | 0.07 | -0.02 |
| | SE | 0.04 | 0.04 | 0.04 | 0.05 | 0.04 |
| | N | 381 | 383 | 382 | 283 | 282 |
| Difference CW_NSQ - DQ | | 0.13 | 0.10 | 0.10 | 0.04 | 0.05 |
| | | SE | 0.05 | 0.05 | 0.05 | 0.05 |
| | | N | 777 | 777 | 770 | 569 |
| Difference CW_RD - DQ | | 0.07 | 0.01 | 0.05 | 0.05 | -0.03 |
| | | SE | 0.05 | 0.04 | 0.04 | 0.04 |
| | | N | 774 | 776 | 774 | 571 |

Conclusions

- Crosswise Model clearly outperforms DQ in both studies:
Respondents report significantly higher prevalence for sensitive behaviors with the Crosswise Model.
- An exception are items with very low prevalence (plagiarism), where SE are just too high to estimate differences precisely.
- Also the Randomized Response Technique (RRT) in the forced response variant is sign. outperformed by the Crosswise Model in 2 of 5 cheating behaviors and always shows higher prevalence estimates (Study B).
- Contrary to RRT, Crosswise does not seem to suffer from the self-protective no-bias which leads to lower prevalence estimates in some cheating behaviors for the RRT compared to DQ.

Conclusions

- The Crosswise Model, therefore, is a promising and probably superior alternative to RRT in self-administered modes such as P&P or Online.
- We also tested the Crosswise Model in a version with an (explicit) randomizing device instead of the non-sensitive question. However, the result for this variant of the Crosswise Model are somewhat less promising than for the non-sensitive question version of the Crosswise Model.
- Another survey is currently under way and will bring about more evidence to clarify whether this finding is robust.

Thank you!

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